Author / Photography: **RICHARD MORRIS**

ROTARY WINGS

We all love gadgets, and this month Richard takes a look at an unusual helicopter that has taken the nation by storm

This month I am going to be looking at something very different. Rather than a conventional helicopter, I am going to introduce you to an innovative quadricopter. The quadricopter in question is the Parrot AR.Drone, which although it is a flying model, is aimed at the video gaming market and to make things even more interesting, may be controlled by means of either an iPhone, an iPad or an iPod Touch. As I am sure you will agree this is certainly something quite out of the ordinary but very interesting.

WHAT MAKES IT SO DIFFERENT?

Parrot are a French technology company, known mainly for their Bluetooth and satellite navigation systems commonly found in the automotive marketplace. Looking for a way into other markets, especially into the sphere of gaming, they came up with the AR.Drone, which in addition to getting the gamer out of his or her chair, should also trigger the imagination. This is where the AR (Augmented Reality) comes into the name and this will allow computer-generated images to be overlayed, on top of the real world images that appear on the control device while the Drone is being operated. For instance, it will be possible to fly a 'virtual' obstacle course, wherever you may be operating the Drone, with the computer generated images overlayed onto the image being transmitted from the front facing camera, mounted in the AR.Drone.

READ THE INSTRUCTIONS FIRST

The Drone comes fully assembled and ready to fly. In the box you will find two bodyshells; one for indoor and the other for outdoor use. In addition you will also find a battery, a charger and the all-important instruction booklet. All that you need to supply is a means by which you can control this machine. Currently you will require an iPhone, an iPad, or an iPod Touch, although software for other devices is currently under development. The battery supplied is a 3S 1000 mAh LiPo and takes about an hour and a half to charge with the balancing charger supplied. While charging the battery I would suggest you read the instruction booklet, as this is a very different type of model to that with which we are accustomed.

HOW IT WORKS

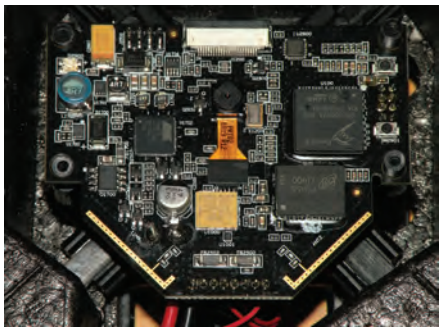
The model itself is reasonably simple, in as much as it is an 'X' format quadricopter measuring 250 mm between propeller centres and approximately 520 mm square, with a weight of approximately 400 g when fitted with the indoor body.

Lift and/or propulsion are supplied by four brushless inrunner

Outside action the AR.Drone hovers with its outdoors shell fitted, you can clearly see the forward looking camera and the green lights on the speed controllers

Here you can see the EPP hull that carries all of the electronics along with the battery in place

The front camera provides a wide-angle view which appears on the device you choose to use to control the drone



In the centre of this picture of the main board you can see the camera that looks underneath connected by the orange ribbon cable and the white connector is where the forward facing camera connects

The main board is shown in situ; the two silver columns are the ultrasonic transducers that determine height above the ground

Below the Drone we see the camera in the centre, the USB port, the ultrasonic transducers with the reset and unpair buttons

motors, one at the end of each of the four booms. Each motor is mounted in a nylon moulding and produces some 35000 rpm at hover and drives a heavily under cambered nylon propeller of 200 mm diameter, through a gear ratio of 8.5:1; hence the need for the indoor body with propeller guards. Built around each motor is a speed controller, to which are attached five wires that come from the AR.Drone's central pod. These wires, in addition to supplying power to the motor, obviously carry signals to the microprocessor situated on the controller.

Moving back to the central pod, once the cover has been removed, the battery compartment is revealed. The battery simply sits in here and is secured by means of a Velcro strap. The battery compartment forms part of the chassis, on to which the electronics are mounted and is contained within an EPP hull. At the front of this hull is mounted the forward facing camera, which gives a 93 degree wide angle view and has VGA resolution of 640 x 480. A flat ribbon cable connects this to the main electronic boards, situated beneath the battery compartment. There are two electronic boards mounted one on top of the other, each approximately 75 mm square in size. The lower board houses a USB port, to enable developers to access the firmware. Next to this you will find the Wi-Fi module and the second onboard camera. Now, while gyros would be adequate to keep the Drone stable, to really lock its position and determine direction and velocity of movement, the image from this second downward facing camera is processed with information from a three-axis accelerometer chip, to provide lateral movement feedback.

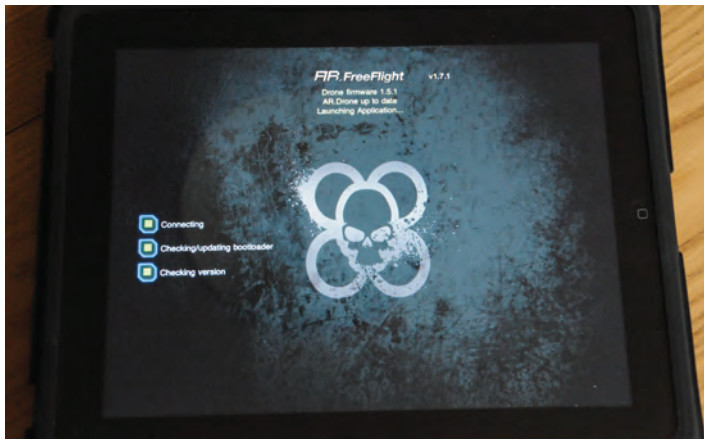
From beneath the Drone, you will also see two 40 KHz ultrasonic transducers that are used to measure height above the ground up to approximately six metres. These operate like simple radar, with one transducer bouncing a signal off the floor and measuring the time taken for the signal to return; from this the height can be determined. There is a two-axis gyro used to control pitch and roll, while an additional gyro takes care of yaw. All of this information is fed back to the main processor, which is an ARM9 468 MHz processor running a Linux operating system and has 128 MB of DDR memory.

PREPARING APP, WI-FI AND IPHONE

Now, I am sure most of you are aware that today's mobile telephone is no longer a simple device on which you can only make a call. You can access the Internet, text, transfer data by Bluetooth and of course take pictures, all in addition to making a call, but the question has to be how on earth do you control a quadricopter?

First of all you will need to access the Internet and visit the App Store and download the application to control the AR.Drone, AR.FreeFlight. Once you have this, you are ready to go through the basic step of getting the AR.Drone connected to an iPhone or any of the other devices mentioned above. Anyone with an iPhone will be aware that it has the ability to connect via Wi-Fi to the outside world, usually through a router that enables you to access the Internet. It is through this ability to use Wi-Fi that the iPhone connects to the AR.Drone. Deep within the Drone there is a Wi-Fi module that uses the industry standard 802.11 b/g to connect, in this case to your phone. This is the same type of system that you would use in your home Internet wireless router. By connecting the iPhone to the router within the AR.Drone

The green light indicates that the Drone is ready to connect to the control device



Upon starting the flying application this is the first screen you are greeted with

Although it is possible to use an iPad to control the Drone the iPhone is much easier to use

Some people just like to get their picture taken; here Jamie Cole takes a close look at the AR.Drone

you have established a network between the two devices across which data can be transferred.

Once the iPhone has been prepared by installing the AR.Free application, you are ready to connect it to the AR.Drone. Unlike conventional models, you firstly need to power up the Drone. This turns on the Wi-Fi module in the Drone. LED lights under the body turn from red to green indicating that the Drone is ready to communicate. Next you turn to the phone and join the AR.Drone network that will have been detected. Once you have done this, you are ready to open the AR.Free application and start flying.

CONTROL-ABILITY

As the AR.Drone I was using had already been flown, the firmware inside was up-to-date so there was no need for any firmware upgrades, which with a brand new machine may well take place automatically before you will be able to operate it. Once the controls appear on screen, overlaid on the view from the front camera, you are ready to start flying.

The controls themselves could not be easier; in the bottom part of the screen there are two round green buttons. The right-hand button controls height and yaw while the left-hand button, when held, allows you to tilt the drone by tilting the iPhone in any direction. At the very bottom of the screen, in the centre, is a tab marked 'Take Off'. Once you are off the ground, this then changes to 'Landing'. Opposite this tab, at the top of the screen, is the Emergency Stop button, which when pressed does exactly that. In addition to these controls there is a battery condition indicator in the top right-hand corner of the screen, while on the left side of the screen you will find a double arrow and a gear icon. The double arrow switches the view between the front camera and the one beneath the Drone (vertically-down view), or if you prefer, you can display the underneath view inset on the main display. The gear icon is where various sensitivities can be adjusted and the trim adjusted as well. It is also possible to switch over the two green buttons, in much the same way as you might change stick mode on a conventional transmitter.

FLY-ABILITY

With the AR.Drone connected via the Wi-Fi to my iPhone I was ready to start flying, so the Take Off button was tapped and AR.Drone started spinning the propellers and took to the air, settling in a hover about one metre above the floor. After about ten seconds or so of this, the Landing button was tapped and within a couple of seconds the Drone had landed itself; it is always good to prove that you can stop a model. Within a couple of seconds the Drone was again in the air, this time the controls were being tested. Everything operated correctly and the front camera was soon looking all around the living room. Obviously the scope for flying in the confines of one's home is limited, but it was great fun moving the AR.Drone from room to room, only using the images from the front camera. In this First Person View (FPV) mode, flying certainly takes on a whole new dimension. While the images from the onboard camera are more than adequate for flying around, it is not possible to record the video stream (this is coming soon as an App; Ed.), although it is possible to use the screen capture function on the iPhone by hitting the home button, and the power button simultaneously, this also works for the iPad.

Having played around indoors for a while, I decided that it would be good to explore the garden. From previous experience with one of these devices, I was aware that the Drone is only capable of flying safely outdoors in the calmest of conditions. So with the outdoor cover fitted I proceeded to the garden to see what conditions were like. To all intents and purposes there was no wind at all, so I decided that now was the time to explore the great outdoors (well the garden at least).

The Take-Off button was pressed and the AR.Drone settled into its usual place about a metre above the ground where it remained in a very steady hover. I started off by moving around and testing the controls still low to the floor and it soon became apparent that as the texture of the ground changed, from grass to concrete, the Drone seemed to hunt slightly, but soon corrected itself and resumed stable flight.

There is no doubt that the AR.Drone is all about having fun and it will be interesting to see what develops from it

Looking from below you can see the transducers that control the height, this is with the Drone about 3 metres off the ground

Taking a close look at the apple blossom the Drone is hovering in the garden while I take the photograph indoors to stop any glare on the screen

In this screen the settings that affect the way the Drone flies can be altered

Flying in the garden with the EPP foam safety guard attached (TvG photo)

Next I decided to increase the flying height, firstly to about two metres then three! Apart from the Drone having to work harder to stabilise itself, there was obviously some air movement, no real difference was noticed and it was easy to fly around at this altitude without any problem. What I did notice however, was that the battery was starting to run low, so rather than run out of power at this altitude, it might be as well to get a little lower to the ground.

The flight time on a battery is about ten minutes, with a charge time of about one and a half hours, so it was just as well I had been supplied with two batteries as this allowed me to continue flying and explore the configuration screen where it is possible to adjust certain parameters to make the Drone fly more to your liking.

Having played around with different settings there is a single button that allows you to return to the defaults, which is probably where most people are going to end up.

CONCLUSIONS

Without doubt the AR.Drone is a triumph of technology and must certainly rate as one of those 'Must Have' gadgets, but where will Parrot's AR.Drone fit into the marketplace? With a retail price tag of £299 and needing an expensive iPhone, iPad or iPod Touch to operate, it could well be out of the price range of most of the PlayStation generation. That said, with further applications such as AR.Pursuit and AR.FlyingAce just about to be launched, being able to dog fight a pair of Drones is a step closer and perhaps this will be enough to spark the imagination of today's teenagers and get them out of their gaming chairs. As for me I believe that the AR.Drone is possibly just the first quadricopter of its type and it will be very interesting to see what is developed from it.

For those who would like to learn more about the Parrot AR.Drone visit the websites of Parrot for the latest information or Flying Toys who can supply you with your AR.Drone. **RCMW**

SPECIFICATION

INFORMATION

NAME:	AR.Drone
MANUFACTURER:	Parrot
DISTRIBUTOR:	Flying Toys Ltd
PRICE UK:	£299.99 (limited period promotional offer £279.99)
ADDITIONAL BATTERY:	£29.99 each
MODEL TYPE:	Wi-Fi Quadricopter
MOTOR:	4x 15 W brushless
FLIGHT BATTERY:	3S (11.1 V) 1000 mAh LiPo (14 g)
CONSTRUCTION:	EPO foam body and carbon fibre framing

R/C FUNCTIONS

1: Tilt forward/reverse
2: Tilt right/left
3: Height
4: Yaw

SPECS

ROTOR DIA:	200 mm
INDOOR HULL:	525 x 515 mm (21" x 20½")
OUTDOOR HULL:	450 x 290 mm (18" x 11½")
FLYING WEIGHT:	360 g (without either hull – incl. battery)

CONTACTS

PARROT
HTTP://ARDRONE.PARROT.COM
FLYING TOYS
WWW.FLYINGTOYS.COM
01702 295110

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